

REMARKS

In the foregoing claim amendments, claims 9, 12, 13 and 16 are amended. Now in the application are claims 9-17, of which claims 9, 12, 13 and 16 are independent. The following comments address all stated grounds for rejection and place the presently pending claims, as identified above, in condition for allowance.

Claim Amendments

Applicant amends claims 9, 12, 13 and 16 to clarify the scope of the claimed invention. Claims 9, 12, 13 and 16 are amended to recite a heating means or step for heating the hydrogen-occlusion alloy to remove the impurities by the released hydrogen based on both of the detection signal from the remaining amount detecting means *indicative of the internal pressure of the hydrogen reservoir being below said predetermined pressure* and the detection signal from the deterioration detecting means *indicative of the hydrogen-occlusion alloy having been deteriorated*. Support for the claim amendments can be found throughout the claims, figures and corresponding descriptions. No new matter is added.

Claim Rejections – 35 U.S.C. §103

Claims 9-15 are rejected under 35 U.S.C. §103 as being unpatentable over Japanese application Publication No. 05-319,802 (“Kawai”) in view of Japanese Application Publication No. 08-094,610 (“Imoto”), and further in view of U.S. Patent No. 5,638,673 (“Yabe”).

In the Office Action, the Examiner cites Japanese Application Publication No. 10-245,202 ("Sato") instead of the Yabe reference. However, in the body of the Office Action, the Examiner discusses and applies the Yabe reference. In light of this, Applicant believes the Sato notation is simply an error, and hence provides arguments with respect to the Yabe reference.

No Motivation to Combine Reference Teachings

Applicant respectfully submits that there is no motivation, either in the cited prior art references or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings.

Kawai relates to a hydrogen purifier using hydrogen-occlusion alloy. Kawai teaches that the hydrogen-occlusion alloy is regenerated using a heater (7) in the hydrogen collecting vessels (1) that also contain the hydrogen-occlusion alloy. Imoto relates to a heat utilization system in which heat is generated using hydrogen-occlusion alloy. The Imoto reference teaches a mass flow meter (4) for measuring the effective amount of hydrogen movement between a first container (1) and a second container (2), both containers being filled with the hydrogen-occlusion alloy. Yabe relates to a power generation system that utilizes hydrogen-occlusion alloy for recovering power from waste heat. Yabe teaches first and second heat exchangers (1, 2) containing hydrogen-occlusion alloy, and a turbine (6) associated with the heat exchangers. Yabe also teaches that the switching operation between the first and second heat exchangers is conducted by the detection of the pressure in the first and second heat exchangers detected by the pressure sensors (16, 17).

In the Office Action, the Examiner notes that it is obvious for one of ordinary skill in the art to combine the mass flow meter taught in Imoto with the device of Kawai to control the heater based on the deterioration detection of the hydrogen-occlusion alloy. Applicant respectfully disagrees.

Applicant submits that there is no motivation to combine the teachings of Kawai and Imoto. If the mass flow meter taught in Imoto is combined with the device taught in Kawai, the resultant combination cannot detect the deterioration of the hydrogen-occlusion alloy. If the mass flow meter is inserted, for example, between the vessels of Kawai as taught in Imoto, the mass flow meter cannot detect the deterioration of the hydrogen-occlusion alloy in the vessels because the mathematical equation taught in Imoto for determining the deterioration of the hydrogen-occlusion alloy cannot apply to the combined device. If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Therefore, there is no motivation to combine the teachings of Kawai and Imoto.

The Examiner also notes in the Office Action that that it is obvious for one of ordinary skill in the art to combine the pressure sensors taught in Yabe with the device taught in Kawai to control the heater based on the remaining amount detection in the hydrogen-occlusion alloy. Applicant respectfully disagrees.

Applicant submits that there is no motivation to combine the teachings of Kawai and Yabe. The hydrogen-occlusion alloy is used for different purposes in Kawai and Yabe. In

Kawai, the hydrogen-occlusion alloy is used for purifying hydrogen while, in Yabe, the hydrogen-occlusion alloy is used for producing hydrogen pressure to rotate the turbine. The different applications of the hydrogen-occlusion alloy do not motivate those of the ordinary skill in the art to combine the teachings of Kawai and Yabe.

Additionally, Applicant submits that there is no motivation to combine all of the teachings in Kawai, Imoto and Yabe. Applicant submits that those of ordinary skill in the art would not be motivated to combine the teachings of the Kawai reference with the teachings of *both* Imoto *and* Yabe references, because the combination of three references results in a complex system that costs too much to implement. The complex structure and high cost of the combined system do not motivate one of ordinary skill in the art to combine the teachings of the cited prior art references. In comparison, an illustrative embodiment of the claimed invention overcomes this problem by providing a flow meter that generates both deterioration detection signals and remaining amount detection signals (See, pages 11-15 of the Specification).

In particular, Applicant submits that the teachings of Imoto and Yabe cannot be combined together because the Imoto reference teaches away from the teachings of the Yabe reference. The Imoto reference teaches using a flow meter to overcome the problems in the conventional systems that employ pressure detectors (See, paragraphs [0005] in Imoto). The Yabe reference, however, teaches using pressure sensors for detecting the internal pressure of the heat exchangers. Therefore, the Imoto reference excludes the use of the pressure detection and *teaches away from* the Yabe reference.

In light of the aforementioned arguments, Applicant submits that there is no motivation, either in the cited prior art references or in the knowledge generally available to one of ordinary skill in the art, to combine reference teachings. Applicant therefore submits that the Examiner fails to establish a *prima facie* case of obviousness, and requests the Examiner reconsider and withdraw the rejection of claims 9-15 under 35 U.S.C. §103.

References Do Not Teach All Limitations of the Claimed Invention

Applicant respectfully submits that the cited prior art references, even if combined, fail to teach or suggest all of the limitations of claims 9, 12 and 13.

Claims 9 and 12 recite an apparatus for regenerating hydrogen-occlusion alloy which includes deterioration detecting means, remaining amount detection means and a heater. In particular, the heater is controlled based on the detection signal from the deterioration detection means *indicative of the internal pressure of the hydrogen reservoir being below said predetermined pressure* and the detection signal from the deterioration detecting means *indicative of the hydrogen-occlusion alloy having been deteriorated*. Claim 13 is a method claim that parallels claim 9.

Applicant submits that the cited prior art references fail to teach or suggest that the hydrogen-occlusion alloy is heated to remove the impurities by the released hydrogen based on both of the detection signal from the remaining amount detecting means *indicative of the internal pressure of the hydrogen reservoir being below said predetermined pressure* and the detection signal from the deterioration detecting means *indicative of the hydrogen-occlusion alloy having been deteriorated*, as recited in claims 9, 12 and 13.

The claimed invention relates to the regeneration of a hydrogen-occlusion alloy. The claimed invention detects the deterioration of a hydrogen-occlusion alloy in a hydrogen reservoir. The claimed invention also detects whether the internal pressure of the hydrogen reservoir falls below a predetermined level. Based on the detection, the claimed invention heats the hydrogen-occlusion alloy up to a temperature that is higher than a temperature for normal releasing of hydrogen so that the hydrogen-occlusion alloy is regenerated.

In particular, the claimed invention regenerates the hydrogen-occlusion alloy without using any vacuum pump that has been used in conventional systems. In the claimed invention, the remaining amount detection means detect whether the internal pressure of the hydrogen reservoir falls below a predetermined level. When the internal pressure of the hydrogen reservoir is below the predetermined pressure, the hydrogen-occlusion alloy is heated up to a temperature that is higher than a temperature for normal releasing of the hydrogen.

The Kawai reference relates to a hydrogen purifier using hydrogen-occlusion alloy. Kawai uses a vacuum pump (12). The Examiner admits that Kawai does not teach remaining amount detection means and deterioration detection means of the claimed invention. Imoto and Yabe are cited by the Examiner to compensate for these deficiencies.

The Imoto reference teaches a hydrogen-occlusion alloy regenerating apparatus in which a hydrogen-occlusion alloy is heated by a heater and the inside of a vessel is evacuated by a vacuum pump. The Imoto reference, however, does not teach the remaining amount detecting means or step recited in claim 9, 12 and 13.

The Examiner relies on the Yabe reference to make up for this deficiency. The Examiner notes in the Office Action that Yabe teaches pressure sensors (16, 17) that correspond to the remaining amount detection means of the claimed invention. Applicant respectfully disagrees with the Examiner.

Applicant submits that the pressure sensors taught in Yabe do not correspond to the remaining amount detection means of the claimed invention. Yabe teaches switching a hydrogen flow path between two heat exchangers (1, 2). The pressure sensors (16, 17) installed in the heat exchangers (1, 2) may produce signals for switching a hydrogen flow path between the first heat exchanger (1) and the second heat exchanger (2). Yabe appear to teach that, for example, when the internal pressure of the first exchanger (1) drops, which is detected by the pressure sensor (16), heating of the first heat exchanger (1) is stopped and the first heat exchanger (1) is cooled by water pumped by the coolant pump (11). (See, Yabe, column 5, lines 35-45).

In contrast, the claimed invention recites heating of the hydrogen-occlusion alloy when the internal pressure of the hydrogen reservoir is below a predetermined pressure. Yabe does not teach *heating* of the first heat exchanger (1) when the internal pressure of the first heat exchanger (1) is below a predetermined pressure. Yabe simply teaches *cooling* of the first heat exchanger (1) when the internal pressure of the first heat exchanger (1) drops.

In light of the aforementioned claim amendments and arguments, the cited references fail to teach or suggest all of the limitations of claims 9, 12 and 13. Claims 10-11 and 14-15,

which depend upon claims 1 and 13, respectively, are not rendered obvious over the cited prior art references. Applicant therefore submits that claims 9-15 are in condition for allowance, and requests the Examiner reconsider and withdraw the rejection of claims 9-15 under 35 U.S.C. 103.

Claim Rejections – 35 U.S.C. §103

Claims 16 and 17 are rejected under 35 U.S.C. §103 as being unpatentable over Japanese application Publication No. 05-319,802 (“Kawai”) in view of Japanese Application Publication No. 08-094,610 (“Imoto”), and in view of U.S. Patent No. 5,638,673 (“Yabe”) and in view of U.S. Patent 5,976,725 (“Gamo”). Applicant respectfully traverses this rejection.

In the Office Action, the Examiner cites Japanese Application Publication No. 10-245,202 (“Sato”) instead of the Yabe reference. However, in the body of the Office Action, the Examiner discusses and applies the Yabe reference. In light of this, Applicant believes the Sato notation is simply an error, and hence provides arguments with respect to the Yabe reference.

Claim 16 relates to a method of regenerating a hydrogen-occlusion alloy in a fuel cell power generating system. Claim 16 recites similar limitations to claim 9, 12 and 13. Claim 17 depends on claim 16.

The Gamo reference teaches a connecting structure between a fuel cell and a hydrogen reservoir. The Gamo reference is cited to provide teachings for the application of the claimed invention to a fuel cell system.

Applicant submits that Gamo does not teach or suggest the remaining amount detecting means recited in claim 16. In addition, the Gamo reference does not teach or suggest that a hydrogen-occlusion alloy is heated to a temperature that is higher than a temperature for normal releasing of hydrogen based on the signal from the remaining amount detecting means, as recited in claim 16.

In light of the argument set forth above, Applicant submits that the cited references fail to teach or suggest all of the limitations of claim 16. Claim 17, which depends upon claim 16, is not rendered obvious over the cited references. Applicant therefore submits that claims 16 and 17 are in condition for allowance, and requests the Examiner reconsider and withdraw the rejection of claims 9-15 under 35 U.S.C. §103.

CONCLUSION


In light of the aforementioned amendment and argument, Applicant contends that each of the Examiners rejections has been adequately addressed and the pending application is in condition for allowance.

Should the Examiner feel that a telephone conference with Applicant's attorney would expedite prosecution of this application, the Examiner is urged to contact the Applicant's attorney at (617) 227-7400.

Respectfully submitted,

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